

REMARKS

Claims 1-3 are presently pending in the captioned application. Subsequent to the enclosed amendment, claim 1 is currently amended, claim 2 is pending as originally filed and claim 3 is pending as previously presented.

Claim 1 has been amended to recite specific features for the diphenylsulfone bridgeable compound, the colloidal silica, and the acrylic emulsion.

In particular, the diphenylsulfone bridgeable compound has been amended to recite an average particle diameter of 0.5 μm . Support for the amendment to the diphenylsulfone bridgeable compound can be found in the specification at page 16, lines 25-26. The colloidal silica has been amended to have a particle size of 10-25 nm. Support can be found at page 4, line 31. The acrylic emulsion has been amended to recite being blended to the thermally sensitive recording layer in a blending amount 3-50 weight parts to 100 weight parts. Support for the amendment to the acrylic emulsion can be found in the specification at page 4, lines 36-37.

No new matter within the meaning of § 132 has been added by any of the amendments.

A machine translation of JP 726671 ("Morita") is enclosed.

Accordingly, Applicants respectfully request the Examiner to

enter the indicated amendments of Appendix A and allow all presently pending claims.

1. Rejection of Claims 1-3 under 35 U.S.C. § 103(a)

The Final Office Action rejects claims 1-3 under 35 U.S.C. § 103(a) as being unpatentable over Morita in view of Tajiri et al. for the reasons of record. The Office Action states:

Applicants' assertion to the contrary, Tajiri et al. compound of formula (1) can be employed alone as the sole preservability improving agent (see column 7, lines 10 and 11). The fact that it would have been obvious to one of ordinary skill in this art to add the compound formula (1) to the recording medium of Morita et al. for a different reason (i.e., image preservation) than that of applicants does not render the combination of references improper.

Furthermore, even if the compound of formula (1) were to exhibit some color developing function, why would this "destroy the function" of a recording medium that already employs color developers? Applicants' claim language "contains acrylic emulsion and colloidal silica" is of such breadth that it fails to exclude the composite particle emulsion of Morita et al. Finally, the fact that applicants obtain "good" results with their representative example does not by itself establish that the results are unexpected. Since the comparative examples are not directed to the closest prior art (i.e., the references applied against their claims), the results set forth in Table 1 are not dispositive of the issue of patentability.

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presently pending claims.

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facie case of obviousness has not been established. The references fail to teach the presently claimed limitations of the diphenylsulfone bridgeable compound having an average particle diameter of 0.5 μm , the colloidal silica having a particle size of 10-25 nm, and the acrylic emulsion being blended to the thermally sensitive recording layer in an amount of 3-50 weight parts to 100 weight parts.

Applicants note that the newly added limitations are not optimization of results effective variables because one of ordinary skill in the art would not have known that changing the properties of the claimed diphenylsulfone bridgeable compound, known within the art as a color *preserving* agent, would affect its properties as a color *developing* agent as claimed by the present invention.

The cited references also teach away from the claimed invention because they require a "composite particle emulsion" in the thermal recording material whereas the presently claimed invention relates to a mixture of an acrylic emulsion and a colloidal silica. This difference is critical to the water resistant properties of the claimed invention and is an unobvious and unexpected finding. It is noted that Applicants have added limitations to the acrylic emulsion and colloidal silica distinguishing them from those cited in the art.

Applicants reiterate once again that one of ordinary skill in the art would not have had any motivation to combine the teachings of Morita with Tajiri *et al.* because the proposed substitution of incorporating the color preserving agent of formula (1) of Tajiri *et al.* with Morita would render the prior art composition of Morita unsatisfactory for its intended purpose.

Although the Final Office Action argued that even if the compound of formula (1) of Tajiri *et al.* was to exhibit some color developing function wherein such function would not allegedly negate or "destroy the function" of the color developers already present in the recording medium, Applicants note that the proposed modification would change the "principle of operation" of the compound of formula (1) of Tajiri *et al.*.

Applicants point out that it was they who discovered the unexpected and improved use of the diphenylsulfone bridgeable compound for use as a color developing agent. Previously, it was thought that the presently claimed diphenylsulfone bridgeable compound is a poor color developer due to its scarcity of -OH groups. However, as discovered by the Applicants, the presence of a spacer such as (-OCH₂CH₂OCH₂CH₂O-) between the diphenylsulfones provides for extra degrees of molecular freedom thereby resulting in improved color developing despite the small amount of -OH

groups.

In view of such facts and considerations, it is clear that the presently claimed invention is unobvious over the cited references.

Rule of Law

The Federal Circuit held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 U.S.P.Q.2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. See Ex parte Clapp, 277 U.S.P.Q. 972, 973 (Bd. Pat. App. & Inter. 1985). The Examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

In determining the propriety of the Patent Office case for obviousness with respect to the allegation of a motivation to

combine, caselaw provide that it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification. In re Linter, 173 U.S.P.Q. 560, 562 (CCPA 1972).

The Federal Circuit further held that the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990).

A statement that modifications of the prior art to meet the claimed invention would have been well within the ordinary skill of the art at the time the claimed invention was made because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levingood, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. & Inter. 1993)

Moreover, the proposed modification cannot render the prior art unsatisfactory for its intended purpose. If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no

suggestion or motivation to make the proposed modification. In re Gordon, 221 U.S.P.Q. 1125 (Fed. Cir. 1984). Similarly, if the proposed modification or combination of the prior art would change the "principle of operation" of the prior art invention being modified, then the teachings of the references are again not sufficient to render the claims *prima facie* obvious. In re Ratti, 123 U.S.P.Q. 349 (C.C.P.A. 1959).

Still further, **the Federal Circuit held that the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.** *In re Mills*, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990).

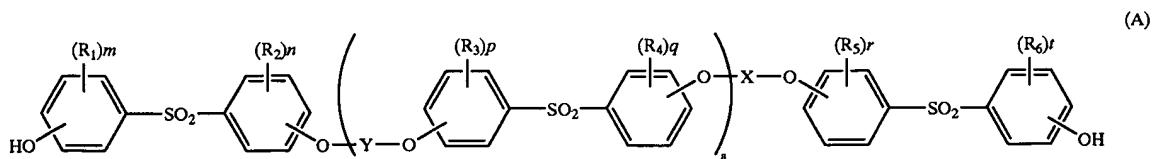
A naked assertion by the Patent Office that modification of the prior art would have been well within the ordinary skill of the art because the references teaching the claimed invention were individually known in the art is **not** sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levengood, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. & Inter. 1993).

Moreover, the proposed modification cannot render the prior art unsatisfactory for its intended purpose if the proposed modification would render the prior art invention unsatisfactory

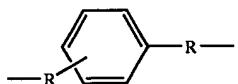
for its intended purpose. In re Gordon, 221 U.S.P.Q. 1125 (Fed. Cir. 1984). If the proposed modification or combination of the prior art would change the "principle of operation" of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. In re Ratti, 123 U.S.P.Q. 349 (C.C.P.A. 1959).

Pending claim 1

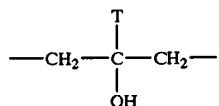
Independent claim 1 recites a thermally sensitive recording medium comprising a thermally sensitive color developing layer containing colorless or pale colored basic leuco dye and a color developing agent as a main components on a substrate, wherein said thermally sensitive recording layer contains acrylic emulsion and colloidal silica, further contains at least one kind of diphenylsulfone bridgeable compound represented by general formula A as the color developing agent,



wherein X and Y can be different or same and indicates a saturated or an unsaturated liner or grafted hydrocarbon group of carbon number 1-12 which can possess an ether bond, or indicate,



or



wherein, R indicates a methylene group or an ethylene group, T indicates a hydrogen atom or an alkyl group of carbon number 1-4, and

R₁-R₆ independently a halogen atom, an alkyl group of carbon number 1-6, or an alkenyl group, further, m, n, p, q, r, t indicate an integer number of 0-4 and when are bigger than 2, R₁-R₆ can be different, and a is an integer of 0-10,

said diphenylsulfone bridgeable compound having an average particle diameter of 0.5 μm,

said colloidal silica having a particle size of 10-25 nm and,

said acrylic emulsion being blended to the thermally sensitive recording layer in a blending amount of 3-50 weight parts of the acrylic emulsion to 100 weight parts of the thermally sensitive recording layer.

Analysis

Applicants respectfully traverse the rejection because the cited references fail to teach a diphenylsulfone bridgeable compound having an average particle diameter of 0.5 μm , a colloidal silica having a particle size of 10-25 nm, and an acrylic emulsion being blended to a thermally sensitive recording layer in an amount of 3-50 weight parts to 100 weight parts.

(i) The references fail to teach every limitation

With respect to the claimed limitation of diphenylsulfone bridgeable compound having an average particle diameter of 0.5 μm , Applicants note that Morita only teaches the "color developer" 4,4'-bis(p-toluenesulfonyl aminocarbonylamino) diphenylmethane and not the presently claimed diphenylsulfone.

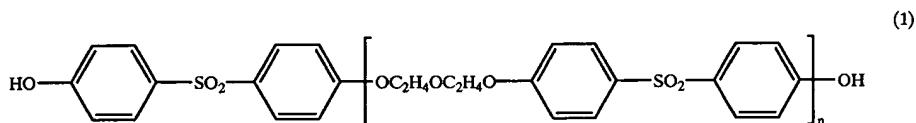
Similarly, Tajiri et al. only teaches N-p-toluenesulfonyl-N'-3-(p-toluenesulfonyloxy) phenylurea used as a "color developer" in a heat-sensitive coloring layer. Despite the allegation that a single use of the specific compound 1,3,5-tris(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)-isocyanuric acid ("D-90") is described by Tajiri et al. at lines 10-11 of col. 7, the combination of other components such as butane derivatives, isocyanuric acid derivatives and phenylsulfone derivatives together with D-90 conclusively shows

that the single use of D-90 is not contemplated by the reference.

In particular, the "preservability-improving" agent of Tajiri et al. as recited in claim 1 clearly states that the claimed mixture is:

(a) at least one member selected from the group consisting of 1,1,3-tris(2-methyl-4-hydroxy-5-cyclohexylphenyl)butane, 1,3,5-tris(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)-isocyanuric acid and 4-benzyloxyphenyl-4'-(2-methyl-2,3-epoxypropyloxy)phenyl sulfone, and

(b) at least one compound represented by the following formula (1)



From this it can be seen that although the compound of formula (1) of Tajiri et al. is similar to the color developing agent of the general formula A of the presently claimed invention, the compound of formula (1) of Tajiri et al. is specifically combined with at least one member selected from the group consisting of 1,1,3-tris(2-methyl-4-hydroxy-5-cyclohexylphenyl)butane, 1,3,5-tris(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)-isocyanuric acid and 4-benzyloxyphenyl-4'-(2-methyl-2,3-epoxypropyloxy)phenyl sulfone, and

sulfone.

In other words, the resulting composition containing the compound of the formula (1) of Tajiri et al. is completely different from that of the claimed invention, the results of which being a "preservability-improving". In clear contrast, the presently claimed agent of the general formula A results in a "color developing agent".

The presently claimed diphenylsulfone bridgeable compound in addition to being a stand-alone color developer has completely different physical properties from those of the reference. In particular, the presently claimed diphenylsulfone bridgeable compound is ground to an average particle diameter of 0.5 μm using a sand grinder. In contrast, the particle size of D-90 used as a preservation improving agent in Tajiri et al. is 1.0 μm as taught at lines 11-12, col. 11. Hence, the particle of Tajiri et al. is twice as large as the particle used in the present invention.

Applicants stress that the presently claimed average particle diameter of 0.5 μm is not optimization of results effective variables because one of ordinary skill in the art would not have known that changing the properties of the claimed diphenylsulfone bridgeable compound known within the art as a color preserving agent would affect its properties as a color developing agent.

As stated previously, Applicants were the first to discover the unexpected and improved use of the presently claimed diphenylsulfone bridgeable compound as a color developing agent. Previously, it was thought that the claimed diphenylsulfone bridgeable compound is a poor color developer due to its scarcity of -OH groups. However, Applicants discovered that the presence of a spacer such as (-OCH₂CH₂OCH₂CH₂O-) between the diphenylsulfones provides for extra degrees of molecular freedom thereby resulting in improved color developing despite the small amount of -OH groups.

With respect to the presently claimed limitations of a colloidal silica having a particle size of 10-25 nm and an acrylic emulsion being blended to a thermally sensitive recording layer in an amount of 3-50 weight parts to 100 weight parts, Applicants note that the references fail to teach the specific limitations.

Morita teaches that the thermally recording layer contains a "composite particle emulsion" of:

- (1) a self-crosslinkable acrylic emulsion and
- (2) colloidal silica (A) and/or
- (3) colloidal silica and an acrylic polymer or styrene-acrylic polymer (B) added to the thermally sensitive layer.

However, the *self-crosslinkable* acrylic emulsion of Morita changes the properties of the prior art composition because the resulting "composite particle emulsion" is prepared by *immobilizing* the colloidal silica into the acrylic resin. But as pointed out in the specification of the present invention, when a "composite particle emulsion" such as the one taught by Morita is used, the ground color of a blank part is inferior when preserved in a humid atmosphere. See specification at page 3, lines 18-23.

Although it is not clear why a "composite particle emulsion" such as those taught by Morita exhibit poor water resistance properties, it has been speculated that the colloidal silica bonds strongly during polymerization with the acrylic particle on the outer surface of the particle wherein the acrylic particles fuse with themselves and thereby obstruct the formation of a film.

But in complete contrast to the poor water resistance properties of the prior art compositions, the presently claimed invention demonstrate unexpectedly improved resistance to humidity and water. This improvement results from the fact that the acrylic emulsion and colloidal silica of the claimed invention are mixed together rather than being polymerized as in the teachings of Morita. The mixing results in colloidal silica being weakly bonded with acrylic particle. There is no obstruction in the bonding of

the acrylic particles themselves and in the film forming function. This results in improved water resistance. This clear difference in composition and structure is not taught nor rendered obvious by the teachings of the prior art. Hence, one of ordinary skill would not have had any motivation or suggestion to combine the references, and a *prima facie* case of obviousness has not been established.

Even assuming *arguendo* that a *prima facie* case has been established, Applicants rebut the presumption with evidence of unexpected results of improved humidity and water resistance. As shown in Table 1 on page 20 of the present application, the thermal recording material of the present invention has good water resistance, good humidity resistance (resistance for ground color fogging) and good printing aptitude. Moreover, the presently claimed material has the unexpected and remarkable effect of being able to have excellent print traveling ability while possessing excellent water resistance properties. The data is made in reference to the closest available prior art and is therefore proper.

In view of the above, it is clear the cited references fail to teach each and every claimed limitation and hence fail to establish the first prong of a *prima facie* case of obviousness.

(ii) The references fail to provide any suggestion or motivation

With respect to the requirement that the obviousness rejection provide some suggestion or motivation to combine, Applicants again maintain that one of ordinary skill would not have been provided with any such suggestion or motivation.

In particular, Morita teaches a thermal recording layer already containing a colorless or light-colored basic dye and a "coupler" wherein the "coupler", which is equivalent to a "color developing agent" of the claimed invention, is 4,4'-bis(p-toluenesulfonylaminocarbonylamino) diphenylmethane. The proposed modification of adding the compound of the formula (1) of Tajiri et al. to the composition of Morita as suggested by the Office Action would result in two different "color developing agents" being present in the thermal recording material. The proposed modification would clearly render the prior art invention of Morita unsatisfactory for its intended purpose because a color developer is already present.

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. Although the Final Office Action argued that even if the compound of formula (1) of Tajiri et al. was to exhibit some color developing function

wherein such function would not allegedly negate or "destroy the function" of the color developers already present in the recording medium, Applicants note that the proposed modification would change the "principle of operation" of the compound of formula (1) of Tajiri et al. This difference in purpose and function is precisely the sort of teaching that fails to provide any suggestion or motivation to combine the references.

In other words, the compound is being used for a different purpose in the cited art wherein the question of whether or not the compound of formula (1) of Tajiri et al. would alter the recording medium and destroy the other color developers is not germane to the question of motivation or combination. The only question that should be asked in this context is whether one of ordinary skill in the art would have been motivated to make the substitution or modification. In re Ratti, 123 U.S.P.Q. 349 (C.C.P.A. 1959).

Clearly, such a motivation is not present because the teachings all relate to the use of the compound as a color preserving agent whereas the presently claimed invention takes advantage of the compound's totally new and unexpected effect as a color developer when having an average particle diameter of 0.5 μm . The "principle of operation" of the claimed compound is clearly different from the compound use in Tajiri et al.

Hence, one of ordinary skill would not have had any motivation to combine the teachings of Morita with Tajiri *et al.* because the proposed substitution of incorporating the color preserving agent of formula (1) of Tajiri *et al.* would render the primary prior art reference, Morita unsatisfactory for its intended purpose.

Accordingly, Applicants respectfully submit that claims 1-3 are unobvious over the cited references and respectfully request reconsideration and withdrawal of the outstanding 35 U.S.C. § 103(a) rejection.

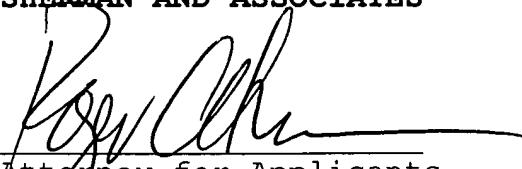
CONCLUSION

In light of the foregoing, Applicants submit that the application is now in condition for allowance. The Examiner is therefore respectfully requested to reconsider and withdraw the rejection of the pending claims and allow the pending claims. Favorable action with an early allowance of the claims pending is earnestly solicited.

Respectfully submitted,

SHERMAN AND ASSOCIATES

SHERMAN AND ASSOCIATES
415 N. Alfred Street
Alexandria, Virginia 22314
703-549-2282



Attorney for Applicants
Roger C. Hahn
Reg. No. 46,376